

DETERMINING THE MARKET FOR THE
LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

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Prepared For:

LOCKHEED CALIFORNIA COMPANY

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DETERMINING THE MARKET FOR THE LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

ABSTRACT

This report explores the market opportunities for the proposed minicomputer- or microcomputer-based, turnkey Lockheed Distributed Graphics (LDG) systems. The particular focus is to determine the acceptance of, and requirements for, CADAM turnkey systems among existing CADAM users. The market is projected through 1985, and current proposals to Lockheed by prospective turnkey vendors of LDG are evaluated.

DETERMINING THE MARKET FOR THE LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

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I INTRODUCTION



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I INTRODUCTION

A. SCOPE

- A primary objective of this study is to determine the market through 1985 for the proposed, minicomputer- or microcomputer-based, turnkey Lockheed Distributed Graphics (LDG) system.
- The particular focus of the research was to determine the acceptance of, and requirements for, CADAM turnkey systems among existing CADAM users (members of CADAM Users Exchange).
- Market projections are presented for Lockheed Distributed Graphics in the CADAM users market sector.
- The role of present CAD/CAM vendors is examined.
- This study also evaluates current proposals to Lockheed by prospective turnkey vendors of LDG.

B. METHODOLOGY

- Interviews were conducted with twelve CADAM users that expressed interest in the proposed Lockheed Distributed Graphics (LDG) system.

- In order to reach twelve respondents with an interest in LDG, seventeen companies were contacted, five of whom (30%) expressed no interest at all in LDG.
 - . These companies were basically large aerospace and automotive companies that felt that their needs were best serviced by large IBM centers.
- A summary of the interview program is shown in Exhibit I-I.
 - Two of the interviews were conducted on-site by INPUT senior staff.
 - All of the respondents are current users of CADAM and members of the CADAM Users Exchange (CUE).
 - The respondents represent a cross-section of CADAM users in the aerospace, mechanical manufacturing and electrical manufacturing industries.
 - . They range in size from \$100 million to \$1 billion in annual revenues.
 - Respondents were in the following fields:

. Engineering	8
. CADAM Coordinators	2
. Software Development	<u>2</u>
Total	12
- In order to evaluate vendors' proposals to Lockheed, INPUT's senior staff conducted informal telephone interviews with the principal contacts at Cal Comp and ADAGE.
 - Interviews with VECTOR GENERAL included the president and one outside member of the Board of Directors.

EXHIBIT I-1

CADAM LDG INTERVIEW PROGRAM

NUMBER OF RESPONDENTS	TYPE OF COMPANY	TELE- PHONE	NUMBER OF RESPONDENTS	SIZE OF COMPANY
		ON- SITE		
3	AEROSPACE	2 1	4	>\$1B
7	MECHANICAL MANUFAC- TURNING	7 0	2	\$500- 1,000 M
2	ELECTRICAL MANUFAC- TURNING	1 1	4	\$100- 500 M
12 TOTAL	-	10 2	2	<\$100 M

TOTAL NUMBER OF RESPONDENTS = 12
(MEMBERS OF CADAM USERS EXCHANGE)

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. USERS' EVALUATION OF CADAM

- The twelve responding companies presently have 70 CADAM stations altogether, for an average of six stations per company.
 - One hundred thirty terminals are deployed.
- Users rated the overall adequacy of CADAM software very highly.
 - This is a clear indication that, in spite of its problems, CADAM is accepted by present users as a very good product in today's market.
 - Expressing some concern about CADAM's ability to keep up with the industry over the next five years, users projected a lower rating for 1985.
- Many of the present CADAM users are experiencing serious problems with system response times.
 - Respondents generally felt that the problem does not lie with CADAM software, but rather with the system being underconfigured with IBM hardware.

B. DESIRED FEATURES

- When considering a CADAM minicomputer- or microcomputer-based distributed graphics system, users decidedly need performance equal to that of present CADAM terminals driven off the mainframe.
 - Users ranked price much less important than performance.
 - Present CADAM users showed little interest in the microcomputer-based system because of degraded performance.
- It is essential that LDG be IBM-compatible and that it have remote communications capability with the in-house host computer.
 - Respondents were nearly unanimous in this regard.
- LDG is viewed as a natural extension of CADAM.

C. MARKETABILITY OF LDG

- In the total sample of CADAM users contacted in this study, 30% expressed no interest at all in CADAM turnkey systems.
 - These were large aerospace or automotive firms that felt that the small turnkey systems did not fit their needs.
- Those 70% of users who were interested in distributed graphics expressed great enthusiasm.
 - All were seriously interested in considering CADAM turnkey systems; none expressed "lukewarm" interest.

- All of the interested companies stated that their needs would best be met by \$150,000 minicomputer-based systems, offering basically the same CADAM capability as stations served by the in-house computer.
- Respondents clearly identified two predominant reasons for buying CADAM distributed graphics turnkey systems.
 - For serving physically remote locations.
 - This need is unmet today.
 - For off-loading the host computer.
 - Many present CADAM users are experiencing serious response time problems due to insufficient computing power in the host computer.
- All respondents reported having requirements for multiple locations of stand-alone, minicomputer-based systems.
 - They would start with one installation and then expand as they experienced favorable results.
- Half of the respondents were not familiar with present CAD/CAM turnkey vendors, and the half that had considered them gave low ratings because these vendors cannot match CADAM software performance.
 - Competition from existing CAD/CAM turnkey vendors is not expected to be formidable due to:
 - Lower performance.
 - Higher price.

- Users rated the need for distributed graphics as a critical prerequisite to realizing the full potential of CADAM.
- A typical comment: "It is inevitable that the need for distributed graphics will be highly critical."

D. MARKET PROJECTIONS

- Respondents identified how many \$150,000 minicomputer-based CADAM turnkey systems they would require now and in 1985.
- Twelve respondents said they needed 28 installations now and 65 installations by 1985.
- Based on the above research results and a stated set of assumptions, INPUT projects that Lockheed's revenues from the licensing of CADAM software for minicomputer-based turnkey systems sold to CADAM users will be:
- \$5 million per year in five years.
- The stated assumptions are:
- Sixty-five CADAM licensees now, growing 10% per year.
- Thirty percent of CADAM users have no interest.
- Results of the study can be extrapolated to the total group of CADAM users.
- A \$25,000 license fee indexed to the price of turnkey systems, growing at the rate of 10% per year.

E. EVALUATION OF VENDORS' PROPOSALS

1. CAL COMP

- Cal Comp's strategy is to market a \$50,000 turnkey, computer-aided drafting system for first-time users in discrete manufacturing.
 - Targeted companies are \$20 million or less in size, with less than 500 employees.
 - This is a growing market now served by competitors like Nocolet CAD and Summagraphics.
- Cal Comp could provide Lockheed with an entirely new market, outside the CADAM user group.
 - The design will probably not be completed before the end of the first quarter in 1981, but there is sufficient validation of the plan for Cal Comp and Lockheed to make a commitment.
 - Cal Comp offers a potentially attractive arrangement.

2. ADAGE

- The ADAGE proposal had not yet been disclosed at the time of this writing.
 - It is believed to be a system based on an IBM plug compatible computer with two to six terminals.
 - ADAGE plans to price it at \$400,000.
 - Further analysis will have to await the details of the proposal.

3. VECTOR GENERAL

- VECTOR GENERAL is an 11-year-old private company that has been completely restructured in the last two years because of management problems.
 - It is now looking very good, and is intensely interested in entering the distributed graphics market with CADAM.
 - \$3 million in outside financing has been tentatively arranged to carry the LDG effort until it is cash positive.
 - The targeted market is the existing CADAM users.
 - The research findings show this to be a good market.
 - Intense competition is not likely because users regard the system as a natural extension of CADAM.
 - The product is well known and proven because it is based on Lockheed's present in-house system.
 - VECTOR GENERAL's plan is nearly complete, and it has offered to share its internal financial analysis with Lockheed.
 - Its plan is based on the premise that VECTOR GENERAL and Lockheed will receive equal profits from the arrangements.
 - The findings of this study are positive with respect to the VECTOR GENERAL plan and will support Lockheed's entering into negotiations if it decides to do so.
 - Dealing with VECTOR GENERAL does not preclude future arrangements with Cal Comp or ADAGE or both.

F. SUMMARY

- The systems and market concepts differ for each of the three vendors proposing to market CADAM turnkey distributed graphics systems.
 - Their potential places in the spectrum of the market are shown in Exhibit II-1.
 - The Cal Comp system would compete with smaller turnkey vendors, like Nicolet CAD and Summagraphics, for the first-time users' market.
 - The VECTOR GENERAL system is a natural extension of CADAM and is not expected to encounter intense competition.
- The ADAGE proposal was not yet definitive at the time of this writing; however, it would appear to compete with the large, minicomputer-based, turnkey vendors like Computervision. The system might be sold either to new markets or to present CADAM users, or both.

G. RECOMMENDATIONS

- Enter the market for LDG CADAM turnkey systems.
 - Target both the market among present CADAM licensees and the market for new customers.
 - Emphasize planned enhancements in the 1985 timeframe.
 - Develop data on cost effectiveness as an aid to sales.

EXHIBIT II-1

SPECTRUM OF CADAM OFFERINGS

MARKET FOR CADAM BY LDG		PRICE AND NUMBER OF TERMINALS	
NEW MARKETS FOR CADAM BY LDG	CAL COMP COMPUTER-AIDED DRAFTING LDG - CADAM \$50,000 1 TERMINAL	VECTOR GENERAL LDG - CADAM \$150,000 1-2 TERMINALS	ADAGE LDG - CADAM \$300-400,000 2-6 TERMINALS
			IBM FULL CADAM \$500,000 AND UP

☐ PROPOSALS

☒ EXISTING IBM BUSINESS

----- YET TO BE PROPOSED

- Continue with VECTOR GENERAL negotiations to arrive at a tentative letter of agreement as soon as possible.
 - Review VECTOR GENERAL's financial analysis of LDG to further validate the plan, and to establish a royalty schedule.
 - Index royalties to future turnkey systems pricing.
 - Review the updated VECTOR GENERAL planning document being prepared for outside investors.
- Consider the possible need for exclusivity in future and long-term agreements with a stronger partner.
- Continue discussions with Cal Comp, but avoid making a commitment until:
 - The plan is properly documented and approved by Cal Comp corporate management.
 - The results of the proposed market research study are known.
 - The Cal Comp validation program is complete.
- Conduct a broader study seeking a stronger partner.
 - Larger company.
 - Multinational in nature.
 - Strong in manufacturing.
 - IBM compatible.

III USERS' EVALUATION OF CADAM

III USERS' EVALUATION OF CADAM

A. PRESENT INSTALLATIONS

- A summary of the number of stations and the number of terminals involved in the respondents' present CADAM installations is shown in Exhibit III-1.
 - Twelve companies accounted for 70 stations.
 - The average number of stations per company is six, ranging from three to 11.
 - One hundred thirty terminals were identified.
 - The average number of terminals per company is 11, ranging from about three to 33.
 - The average number of terminals per station is 1.9, ranging from 1.3 to 3.1.
- These results reflect the large variance in the size of companies included in the interview sample.
 - All except one of the computer centers were IBM, the exception being ITEL.

EXHIBIT III-1

RESPONDENTS' PRESENT CADAM SYSTEM INSTALLATIONS

SIZE CATEGORY- (NUMBER OF STATIONS PER RESPONDENT)	NUMBER OF RESPONDENTS	TOTAL NUMBER OF STATIONS	TOTAL NUMBER OF TERMINALS	AVERAGE NUMBER OF TERMINALS PER STATION
1-4	5	13	17	1.3
5-8	5	36	48	1.3
9-12	2	21	65	3.1
OVERALL	12	70	130	1.9

- The two largest installations were both aerospace firms.

B. CADAM SOFTWARE

- Users' ratings of the individual modules of CADAM software are shown in Exhibit III-2.
 - There is a wide disparity in the number of respondents rating each individual module, ranging from 1 to 10.
 - The small number of respondents rating some of the modules is indicative of both the prevalence of use of the module and the degree of user understanding.
- Four of the modules were rated by 60-80% of the respondents, which makes the ratings more meaningful. These four are:
 - CAD/CAM Interactive Module.
 - Statistical Data and Report Generation Module.
 - Hardcopy Module.
 - Data Management Module.
- These ratings are shown in Exhibit III-3. The average ratings are comfortably above the mid-range of the rating scale, but the dispersion indicates considerable disagreement among users concerning the adequacy of the individual modules.

EXHIBIT III-2

USERS' DEGREE OF SATISFACTION WITH THE CADAM SOFTWARE MODULES

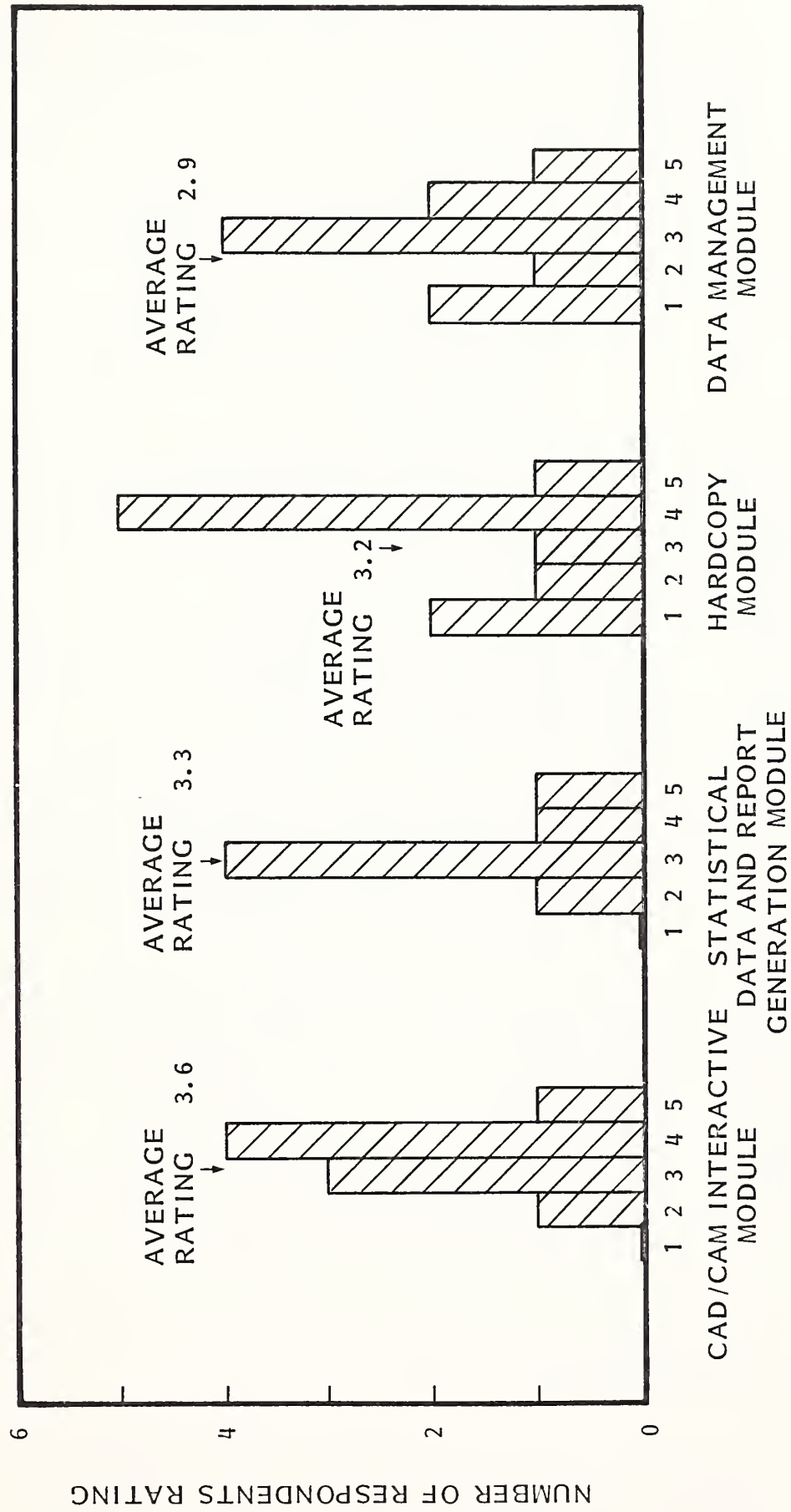
TYPE OF MODULE	PERCENT OF RESPONDENTS RATING	AVERAGE RATING
DATA MANAGEMENT MODULE	83%	2.9
HARDCOPY MODULE	83	3.2
CAD/CAM INTERACTIVE MODULE	75	3.6
STATISTICAL DATA & REPORT GENERATION MODULE	58	3.3
GEOMETRY INTERFACE MODULE	42	3.2
CAD-ONLY INTERACTIVE MODULE	33	4.3
AUTOMATIC PROGRAMMED TOOL (APT) INTERFACE MODULE	33	3.2
ACCOUNTING INFORMATION MODULE	25	3.0
3D DESIGN - SURFACE GEOMETRY	17	3.5
3D DESIGN - MESH GEOMETRY	10	4.0

TOTAL NUMBER OF RESPONDENTS = 12

RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND 1 IS UNSATISFACTORY

EXHIBIT III-3

USERS' DEGREE OF SATISFACTION WITH THE CADAM SOFTWARE (MODULES RATED BY >50% OF RESPONDENTS)



RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND 1 IS UNSATISFACTORY

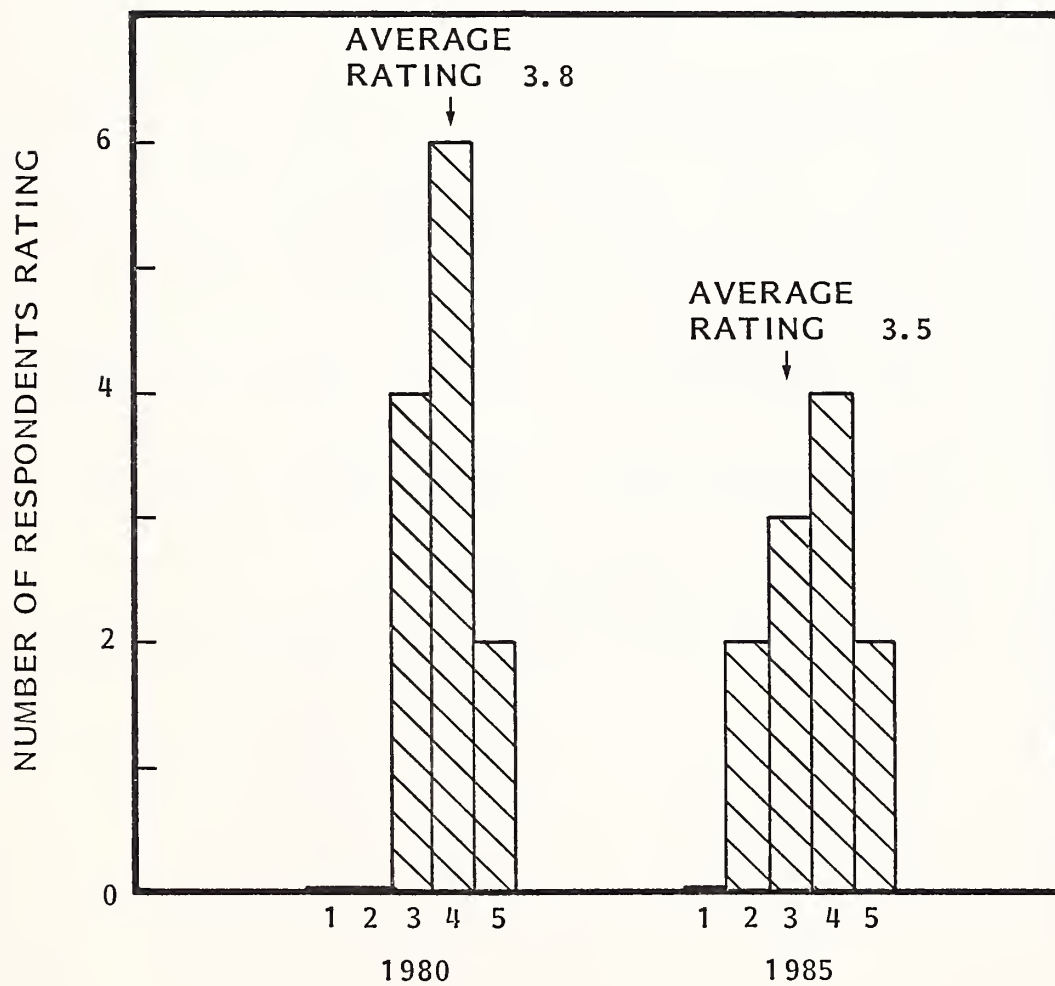
- When rating the adequacy of CADAM software overall, users were much more in agreement. Users' ratings of the overall adequacy of the CADAM software, now and in 1985, are shown in Exhibit III-4.
 - The present rating of 3.8 (on a scale where 5 is completely satisfactory) is a good mark.
 - The ratings are very consistent, with no responses below mid-range.
 - This is a clear indication that, in spite of its problems, CADAM is accepted by present users as a very good product in today's market.
 - Users are not so sure about CADAM in 1985, the rating is lower and the dispersion is apparent.
 - This reflects users' concern that CADAM enhancements and new applications might not keep pace with increasingly complex engineering designs and manufacturing processes over the next five years.
- The typical user's acceptance of CADAM in today's market is reflected by respondents' comments concerning the adequacy of CADAM system software, shown in Exhibit III-5.
 - Many of the more detailed comments by respondents related to the problems encountered with new releases.

C. SYSTEM RESPONSE TIMES

- Users' ratings of CADAM systems' response times, now and in 1985, are shown in Exhibit III-6.

EXHIBIT III-4

USERS' RATINGS OF THE
OVERALL ADEQUACY OF
CADAM SOFTWARE -
NOW AND IN 1985



RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND 1 IS UNSATISFACTORY

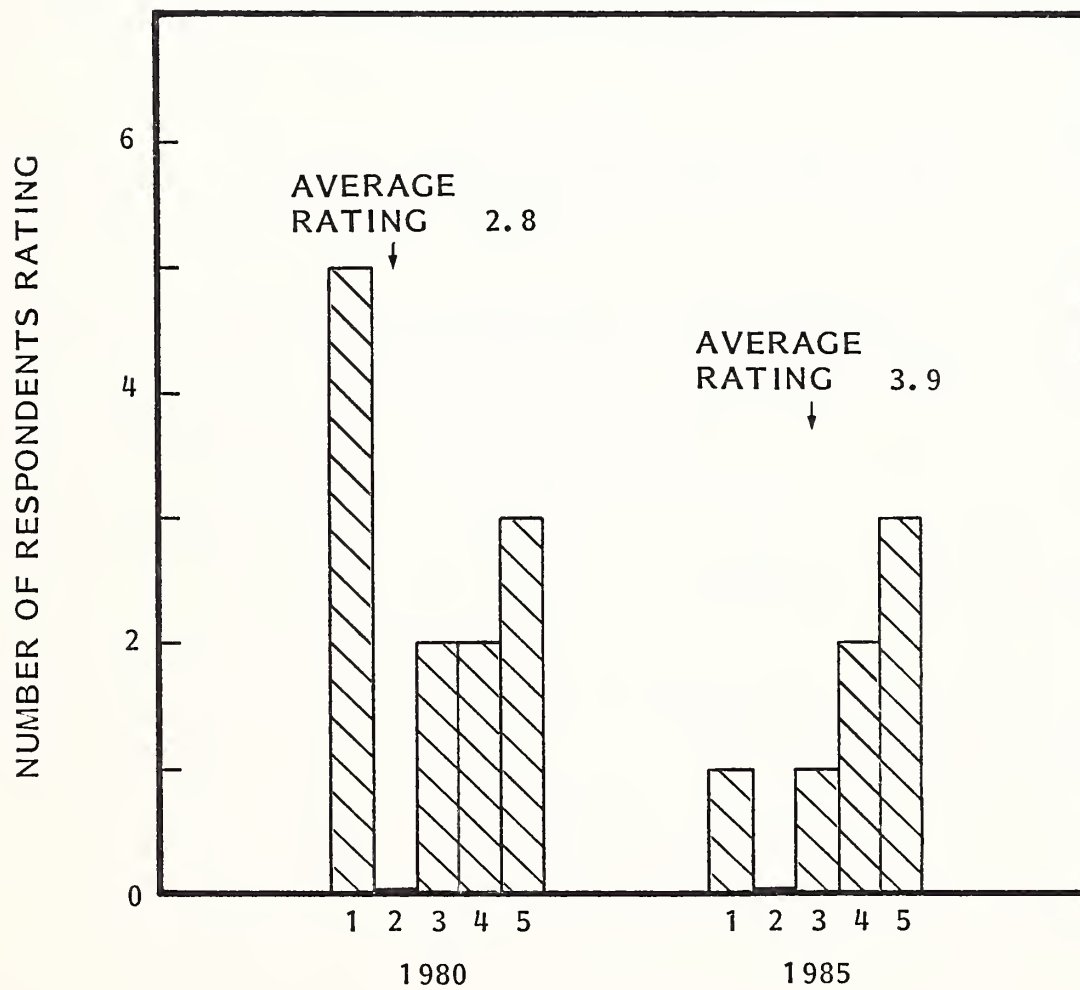
EXHIBIT III-5

RESPONDENTS' TYPICAL COMMENTS
CONCERNING THE PRESENT ADEQUACY OF CADAM
SYSTEMS SOFTWARE

- "TOO EXPENSIVE TO MAKE COST EFFECTIVE OVERALL - MANAGEMENT IS UNWILLING TO EXPAND THE SYSTEM."
- "DOES A GOOD JOB AS CURRENTLY DESIGNED. THE SYSTEM IS AHEAD OF THE ORGANIZATIONAL CAPABILITY TO USE IT."
- "I CAN'T BRAG ABOUT IT, BUT I CAN'T CRITICIZE IT EITHER."
- "DESPITE PROBLEMS, IT HAS GIVEN US A GOOD PAYBACK."
- "WE ARE VERY HAPPY WITH IT."

EXHIBIT III-6

USERS' RATINGS OF CADAM
SYSTEMS RESPONSE TIMES AS A PROBLEM -
NOW AND IN 1985



RATED ON A SCALE WHERE 5 IS NO PROBLEM AT ALL AND 1 IS A MAJOR PROBLEM

- To most users in the interview sample, response times are a major problem.
- The ratings reflect widely different experiences with response times, but 60% of the users believe they are a problem.
- The 0.5 second response time that CADAM is designed for is not widely achieved.
 - . For many, response times are measured in seconds, not fractions of a second.
- There is a general feeling that the problem does not lie with CADAM software, but rather with being underconfigured on IBM hardware.
- Respondents appear to be optimistic about solving the problem by 1985.
 - . The average rating improved from 2.8 in 1980 to 3.9 in 1985.
- The following are typical comments by users about today's response time problems:
 - . "Our response time problems have nothing to do with CADAM but with the CPU."
 - . "Our paramount problem in response times is not a fault of CADAM. IBM configured the system too small."
 - . "Response times are running three to four seconds, even though we added a second IBM 370-148."
 - . "Ninety-eight percent of the time response times are running about two seconds."
 - . "Averaging ten seconds on the whole."

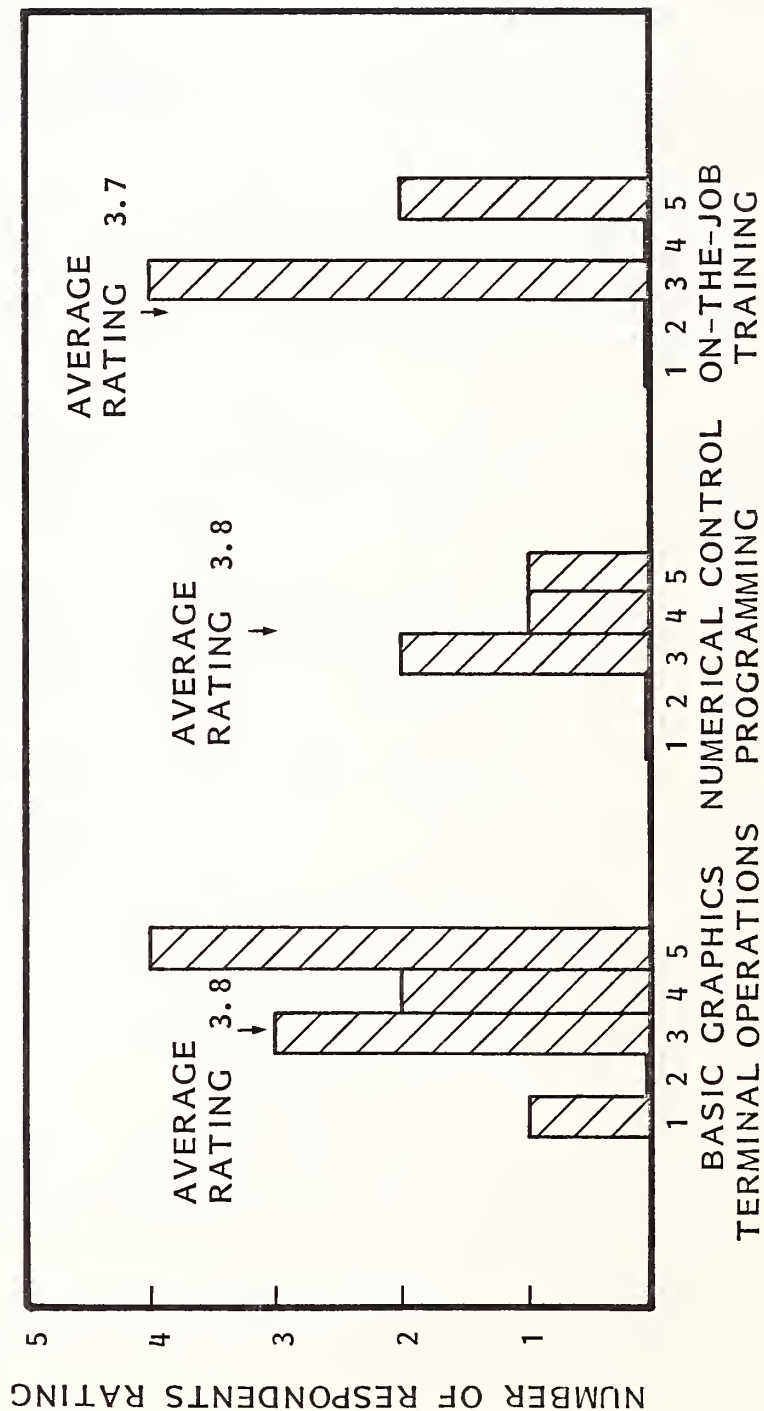
D. TRAINING AND SYSTEM SUPPORT

I. TRAINING

- Users' degree of satisfaction with the CADAM training courses is shown in Exhibit III-7.
 - The relatively high ratings (averaging just under 4 on a scale where 5 is completely satisfactory) indicate that the training courses are effective and generally well accepted.
 - However, suggestions for improvement in the courses were made, as follows:
 - The courses are sometimes not relevant to the needs of small users. The material is presented at too sophisticated a level.
 - The classes sometimes lack structure.
 - Some respondents expressed a need for a course designed for software systems people.
- Users expressed dissatisfaction with CADAM training documentation. The rating results are shown in Exhibit III-8.
 - Although users have widely differing opinions, over 40% regard training documentation as unsatisfactory.
 - The following suggestions for improvement were offered:
 - Document the material in a format for non-computer persons.

EXHIBIT III-7

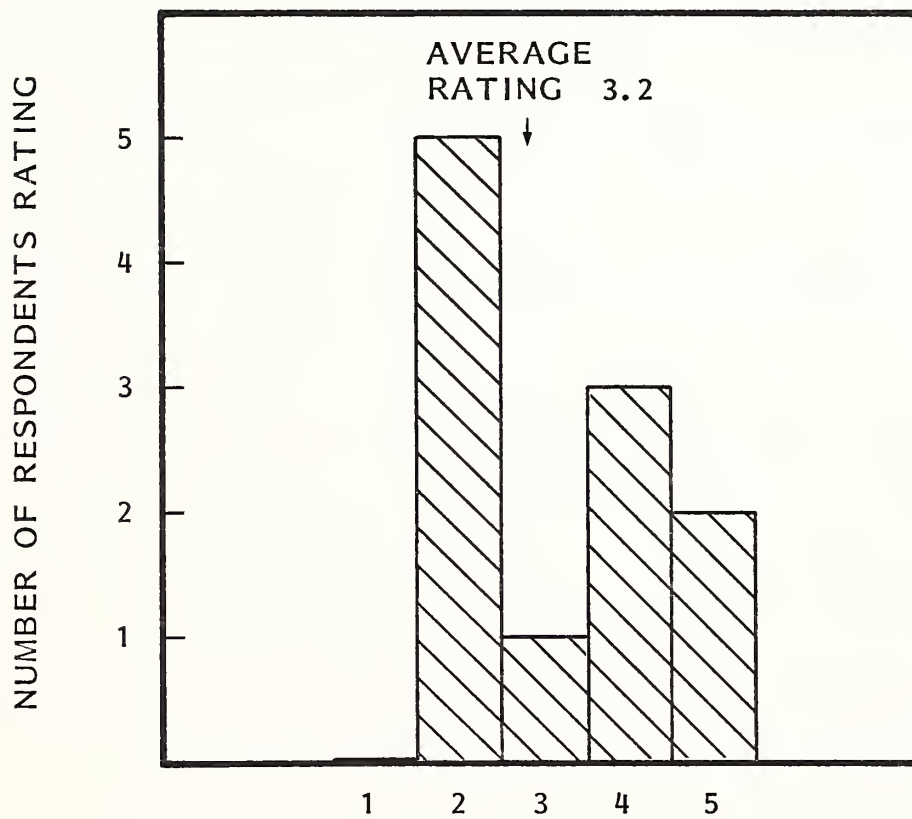
USERS' DEGREE OF SATISFACTION WITH THE CADAM TRAINING COURSES



RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND 1 IS UNSATISFACTORY

EXHIBIT III-8

USERS' SATISFACTION WITH CADAM
TRAINING DOCUMENTATION



RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND
1 IS UNSATISFACTORY

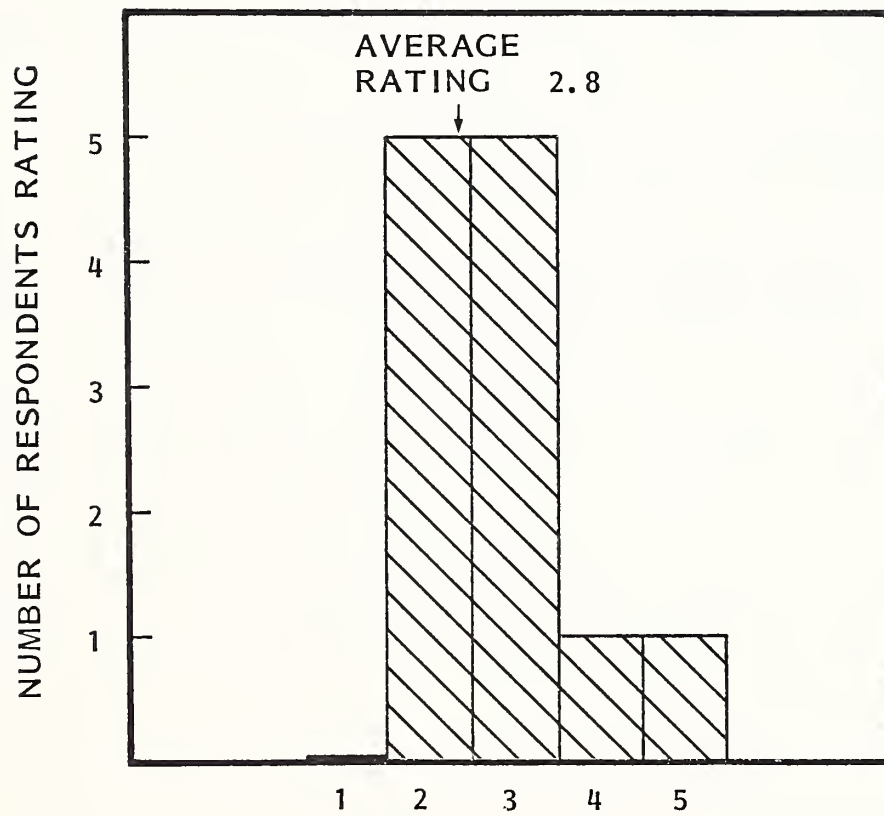
- . For smaller users, the material should not be geared for highly sophisticated aerospace design.
 - . Present more on the value of implementing new releases and identify expected problems.
 - . Although detailed steps are documented, they should also be integrated into an overall concept.
- Two-thirds of the respondents would prefer on-site training to be done for the following reasons:
 - Personnel trained on the companies' systems could spend more time with the system.
 - Training at the vendor's location involves exposure to everybody's problems, which are not always specifically applicable.
 - Training on-site develops a better familiarity with the system within the company environment.

2. SYSTEM SUPPORT

- Users expressed a clear dissatisfaction with CADAM user support, as shown in Exhibit V-9.
 - The dissatisfaction is generally with the IBM system support, not with Lockheed.
 - Respondents feel that IBM sends untrained technicians with no hands-on experience.

EXHIBIT III-9

USERS' SATISFACTION WITH
CADAM SYSTEM SUPPORT



RATED ON A SCALE WHERE 5 IS COMPLETELY SATISFACTORY AND
1 IS UNSATISFACTORY

- One respondent stated: "Lockheed has been more than helpful, I would rate them a 5; but IBM has been less than helpful, I would rate them a 1."
- IBM is regarded as having an inadequate staff of engineers as well.
- Users are talking to other CUE members to solve mutual problems.

E. SYSTEM IMPROVEMENTS

- Users' suggestions for new CADAM software enhancements, support packages and new applications are shown in Exhibit III-10.
 - These suggestions generally support Lockheed's planned 1980-1981 CADAM enhancement program.
 - However, the following enhancements on Lockheed's list were not mentioned:
 - . Electrical (PCB) capability.
 - . Piping.
 - . Increased precision.
 - . Interactive user exit.

EXHIBIT III-10

USERS' SUGGESTIONS FOR NEW CADAM SOFTWARE ENHANCEMENTS, SUPPORT PACKAGES AND NEW APPLICATIONS

- IMPROVED:
 - 3D CAPABILITY
 - NUMERICAL CONTROL
 - STATISTICAL DATA AND REPORT GENERATION
 - NEW RELEASE DEBUGGING
- VM/CMS CONVERSION
- COMMON GRAPHICS STANDARDS

IV DESIRED FEATURES OF THE LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

IV DESIRED FEATURES OF THE LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

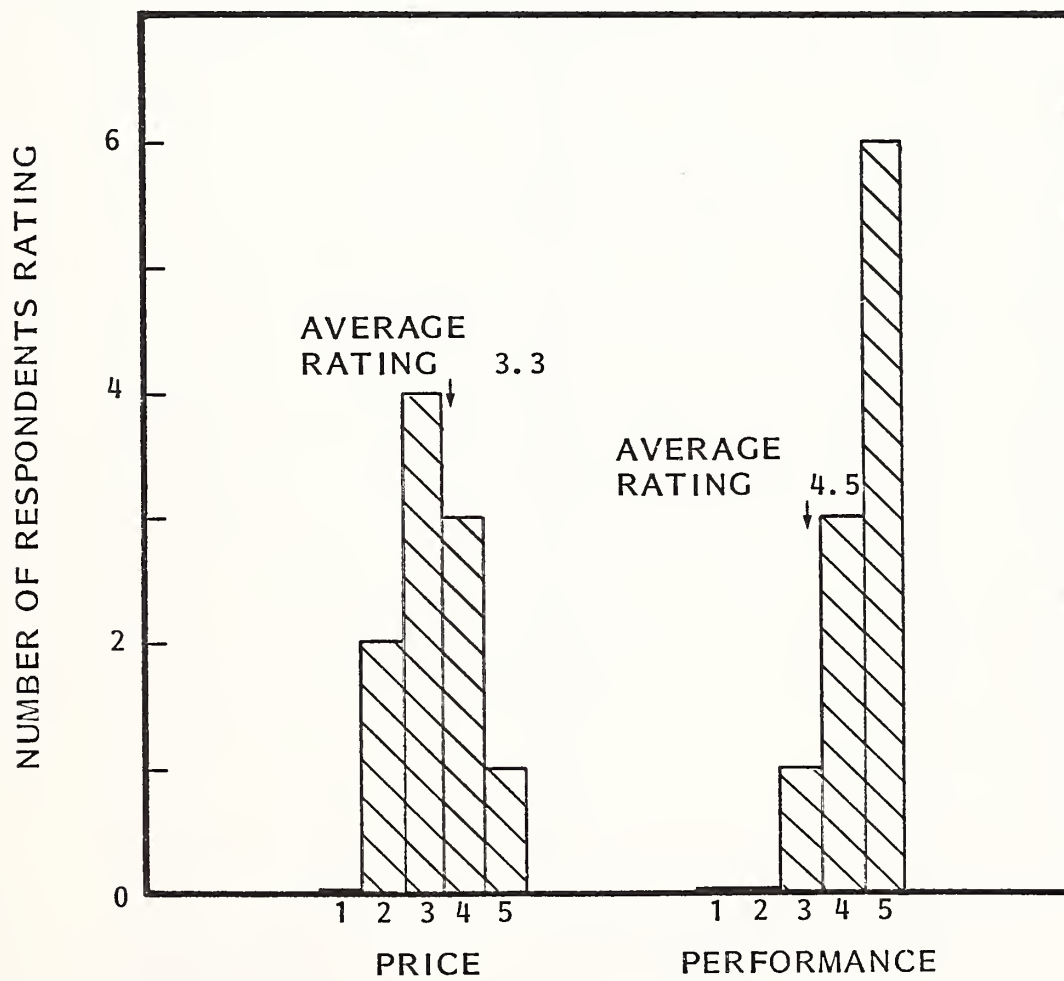
A. PRICE AND PERFORMANCE

- The basic premise of this study is to offer CADAM users the opportunity to extend CADAM to installations requiring less than five stations by means of turnkey systems; i.e., Lockheed Distributed Graphics (LDG) systems.
 - Implicit in this premise is that the minicomputer-based system, selling at a base price of about \$150,000, would offer the same CADAM capability as stations served by the in-house computer.
- In other words, the fact that CADAM was running on a turnkey system would be transparent to the users.
- Respondents were offered the option of a microcomputer-based system, with reduced CADAM capability, at a base price of \$50,000.
 - This option drew almost no positive response.
 - Clearly the focus of CADAM users' interest is with the minicomputer-based system.

- Within the context of performance equivalent to CADAM, respondents rated the relative importance of price versus performance in buying turnkey systems. The results are shown in Exhibit IV-1.
 - Respondents were clearly in agreement as to the importance of performance, with 90% rating it 4 or 5 (on a scale where 5 is the most important factor), for an overall rating of 4.5.
 - Respondents were of divided opinion as to the importance of price, but rated it much lower.
 - INPUT concludes that, as long as the price of the minicomputer-based turnkey system is kept below the present turnkey system range (under \$200,000), the market with CADAM users is relatively insensitive to price.
- It is essential that LDG be IBM-compatible and have a remote communications capability with in-house computers. Respondents' ratings of the importance of IBM compatibility and networking with the host are shown in Exhibit IV-2.
 - Respondents are nearly unanimous in rating these features essential.
 - The solution of moving computing power to remote sites and networking with the in-house computer(s) is basic to the acceptance of LDG systems.
- Users view the turnkey systems as a natural extension of CADAM.
 - When asked whether they viewed the CADAM distributed graphics turnkey systems as a natural extension of, or an alternative to, the present Lockheed/IBM CADAM systems, ten out of twelve regarded it as a natural extension.

EXHIBIT IV-1

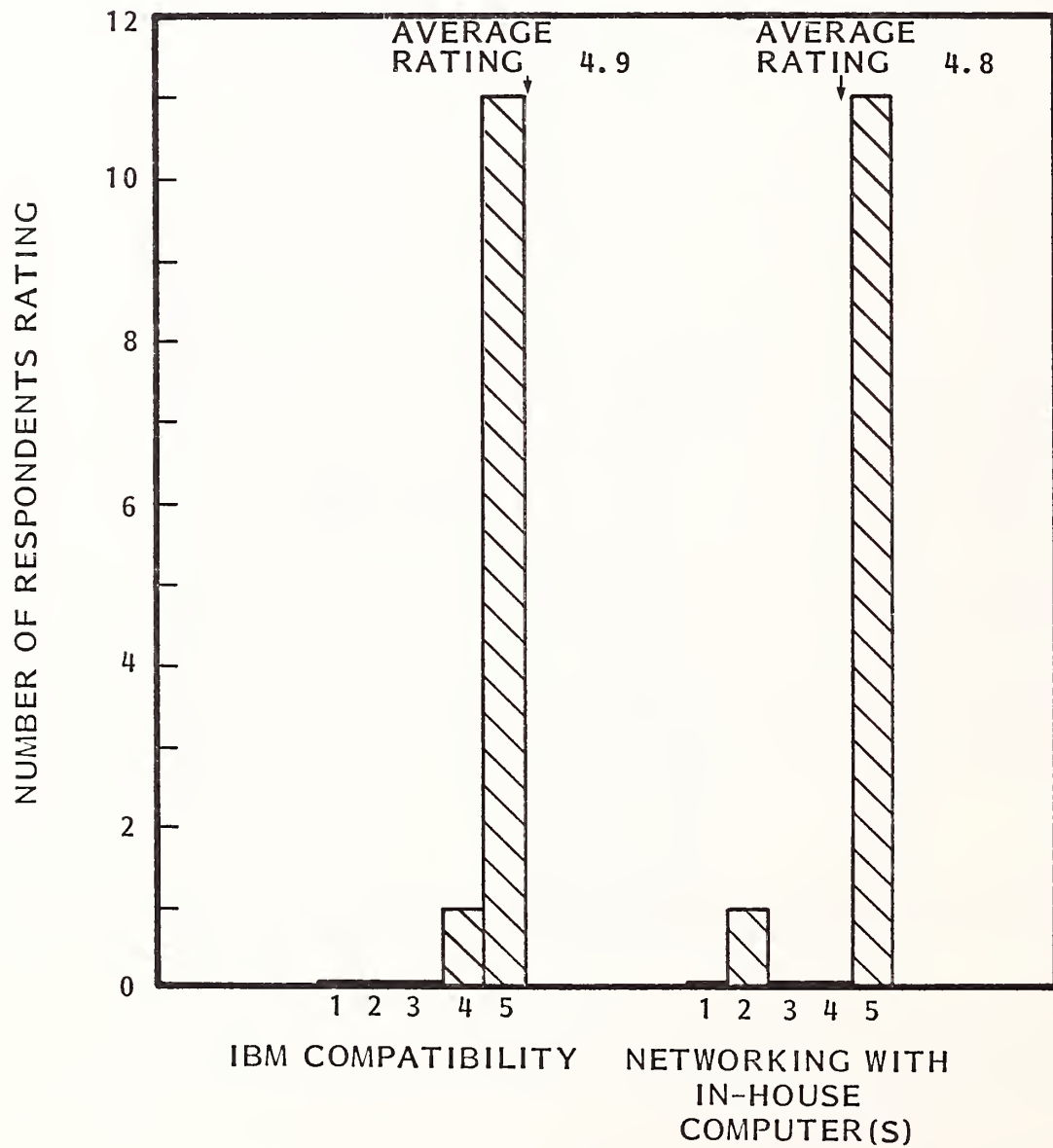
RELATIVE IMPORTANCE OF PRICE
VERSUS PERFORMANCE IN BUYING TURNKEY SYSTEMS



RATED ON A SCALE WHERE 5 IS THE MOST IMPORTANT FACTOR, AND 1 IS
RELATIVELY UNIMPORTANT

EXHIBIT IV-2

IMPORTANCE OF IBM COMPATIBILITY AND NETWORKING WITH IN-HOUSE HOST COMPUTERS



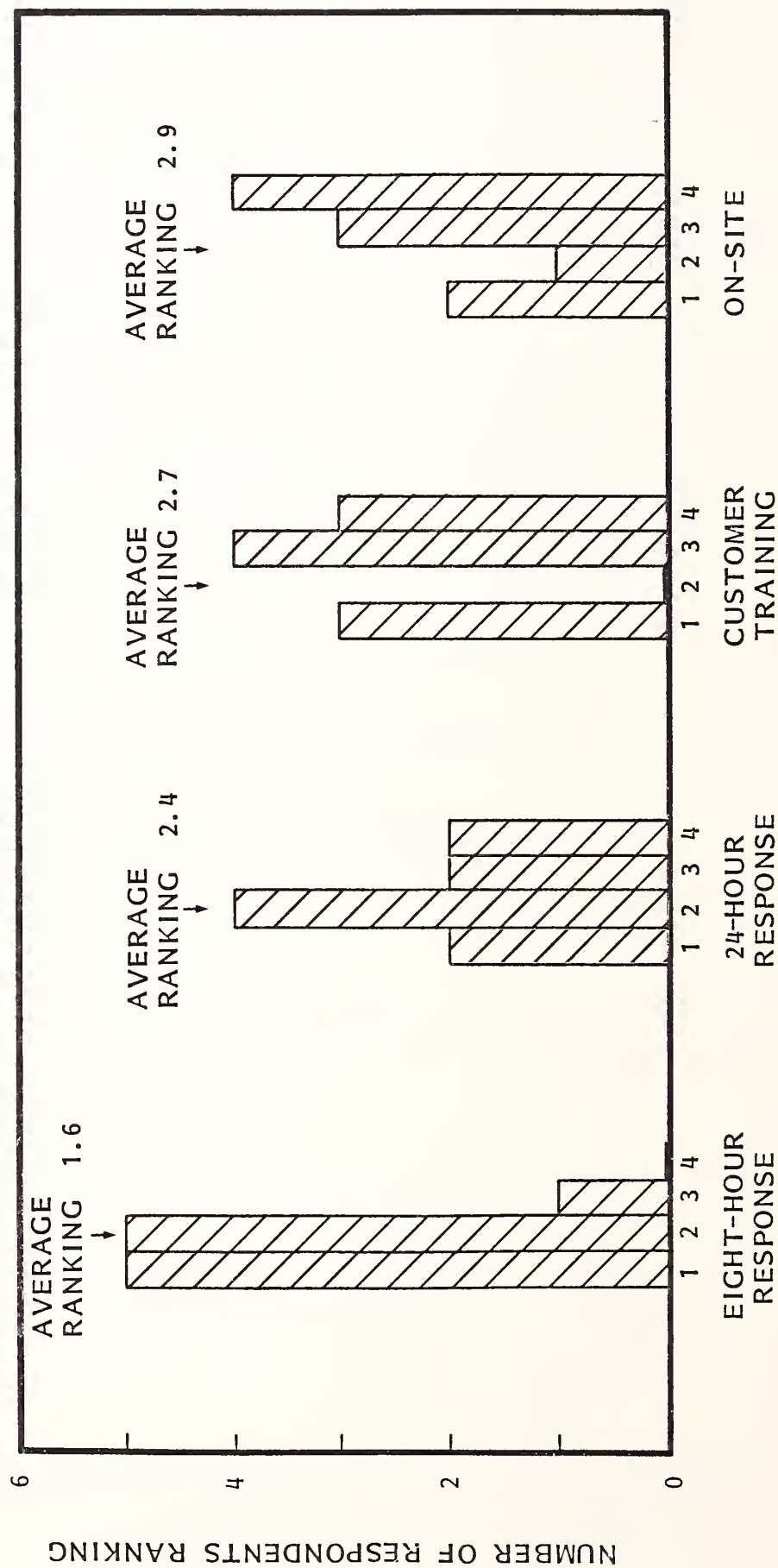
RATED ON A SCALE WHERE 5 IS ESSENTIAL AND 1 IS UNIMPORTANT

- The general attitude of the users is that LDG offers solutions to needs that otherwise will not be met.

B. FIELD SERVICE

- Users were asked to rank (not rate) in order of priority (where 1 is highest) their requirements for field service. The results are shown in Exhibit IV-3.
 - Over 90% of the respondents ranked eight-hour service either first or second.
 - . It is the preferred service for most companies.
 - . This is so because it is regarded as the most cost effective.
 - The very mixed rankings of the other options for field service reflect the large variations in the size of the companies and their CADAM installations.
 - The two companies that ranked on-site service first are both large aerospace firms that can justify the expense of resident vendor personnel.
 - . Both of these respondents ranked eight-hour service second.
 - The mixed ranking of customer training, or user self-maintenance, reflects the large variation of internal capability among the respondents.
- As a general conclusion, there is apparently a need for all four levels of field service in order to satisfy the specific needs of all companies.

EXHIBIT IV-3 USERS' RANKING OF REQUIREMENTS FOR FIELD SERVICE



RANKED ON A SCALE WHERE 1 IS THE HIGHEST PRIORITY AND 4 IS THE LOWEST PRIORITY

V MARKETABILITY OF THE LOCKHEED
DISTRIBUTED GRAPHICS SYSTEM

V MARKETABILITY OF THE LOCKHEED DISTRIBUTED GRAPHICS SYSTEM

A. DEGREE OF INTEREST IN LOCKHEED DISTRIBUTED GRAPHICS

- The expressed degree of user interest in extending CADAM by means of turnkey distributed graphics systems is shown in Exhibit V-1.
 - Thirty percent of the respondents had no interest at all in considering turnkey systems.
 - . They were all large automotive or aerospace firms.
 - . These companies have very large IBM computer centers, and they feel that the small turnkey systems do not suit their needs.
 - . This is not an unexpected result. It should hold true for the larger universe of CADAM users.
 - Those 70% of users who were interested in distributed graphics expressed great enthusiasm.
 - . All were seriously interested in considering CADAM turnkey systems. None expressed lukewarm interest.

EXHIBIT V-1

DEGREE OF USER INTEREST IN EXTENDING CADAM BY MEANS OF TURNKEY DISTRIBUTED GRAPHICS SYSTEMS

DEGREE OF INTEREST	NUMBER OF RESPONDENTS	PERCENT OF RESPONDENTS
VERY INTERESTED	9	53%
WOULD LIKE TO CONSIDER	3	17
MODERATELY INTERESTED	0	0
LITTLE INTEREST	0	0
NO INTEREST AT ALL*	5	30
TOTAL	17	100%

*INTERVIEWS TERMINATED
NUMBER OF RESPONDENTS = 17

- All of the interested companies stated that their needs would be best met by minicomputer-based systems, selling at a base price of \$150,000, that offered basically the same CADAM capability as stations served by their in-house computers.
- Forty percent of the respondents stated that they would consider a small, microcomputer-based system as well - if the CADAM performance was there.
 - However, none of the small systems were identified as being required for their present or future needs.
 - Users feel that it is not credible that microcomputer-based systems would achieve adequate performance.
- INPUT concludes that, among existing CADAM users, the market for microcomputer-based systems with diminished CADAM performance is relatively unattractive.

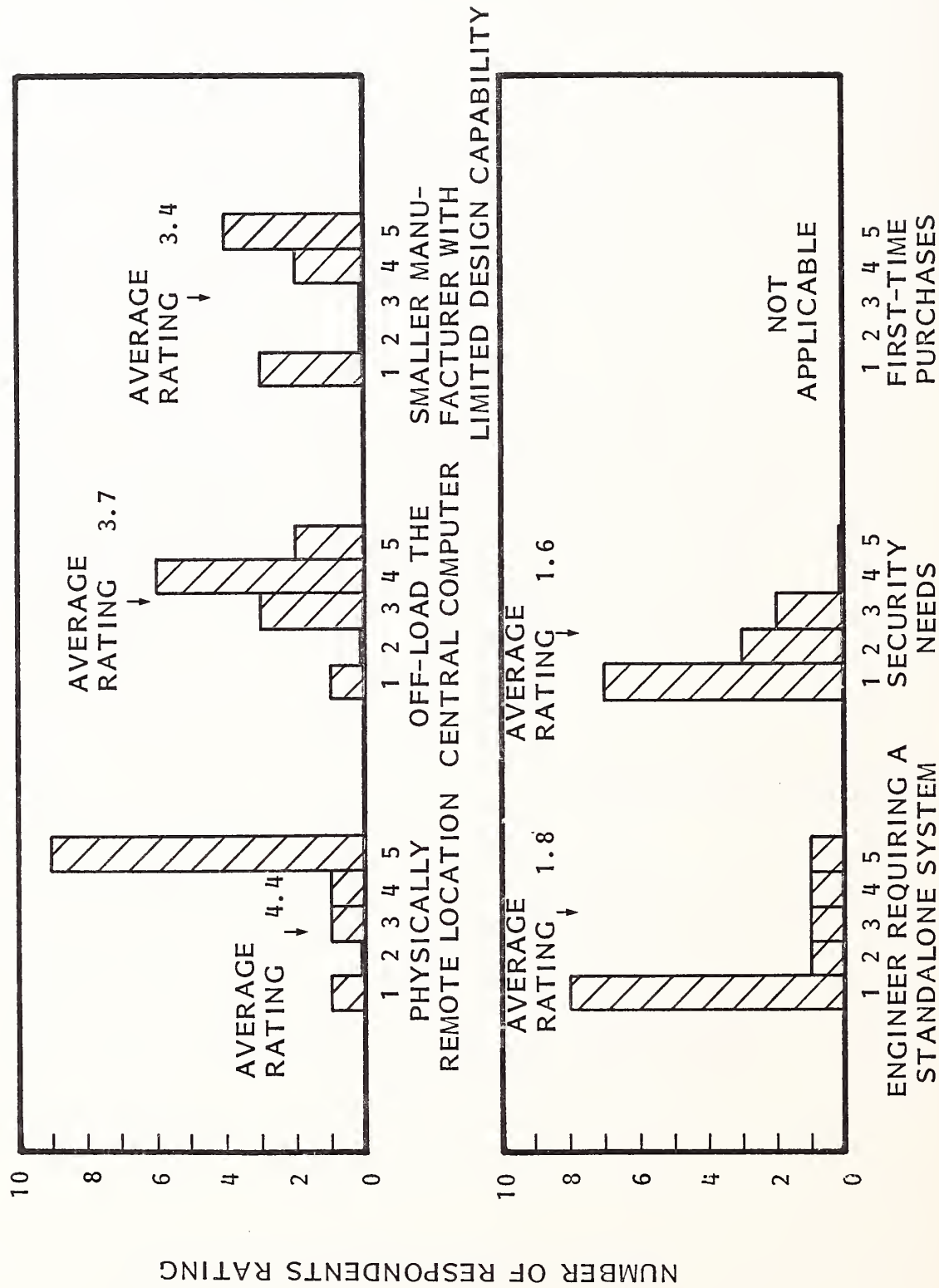
B. BUYING PATTERNS

- Respondents' ratings of the most important reasons for buying CADAM distributed graphics turnkey systems are shown in Exhibit V-2.
- Using CADAM turnkey systems to service physically remote locations is clearly the most important need.
 - Nearly all respondents agreed.
 - This is so because remote use of the present CADAM terminals tied to the in-house IBM host is not feasible. Needs of remote users are presently unmet.

EXHIBIT V-2

MOST IMPORTANT REASONS FOR BUYING CADAM DISTRIBUTED

GRAPHICS TURNKEY SYSTEMS



RATED ON A SCALE WHERE 5 IS MOST IMPORTANT AND 1 IS UNIMPORTANT

- Placing computing power on-site solves this problem.
- Most respondents agreed that another important benefit is to off-load the host computer.
- Many of the CADAM users reported capacity problems with their CPUs, as evidenced by the response time problems.
- The four other possible reasons for buying LDG are not nearly as important to CADAM users as remote locations and off-loading the host.
 - Ratings given for use by smaller manufacturers show disagreement among the respondents.
 - Respondents indicated that providing an engineer a standalone system could not be cost justified.
 - Security needs are not of major importance for LDG.
 - First-time purchasers may well be an important reason, but they are not applicable to present CADAM users who already have a major commitment to CADAM.
- All respondents reported having requirements for multiple locations of stand-alone, minicomputer-based systems.
 - All respondents also would follow the prudent course of starting with one installation and then adding more as they gained favorable experience.
 - CADAM users can be expected to make tentative plans for multiple locations from the beginning, but implementation of a new system like LDG will be step by step.

- Virtually 100% of CADAM processing in the responding companies is currently done on the large host system.
 - However, half of the respondents felt that the need for turnkey systems, largely driven by economics, would change the mix in mode of delivery to 80% in-house and 20% turnkey by 1985.
 - . This is a good indication of the turnkey market.
 - None of the respondents reported a future trend to remote computing services for CADAM.
- In the event that rights to the CADAM software for the LDG system were leased separately from the hardware purchase, respondents would currently be unable to express their preferences for fully paid-up lease, monthly lease, or purchase.
 - This choice would depend on factors that are unclear to the CADAM users at this time.

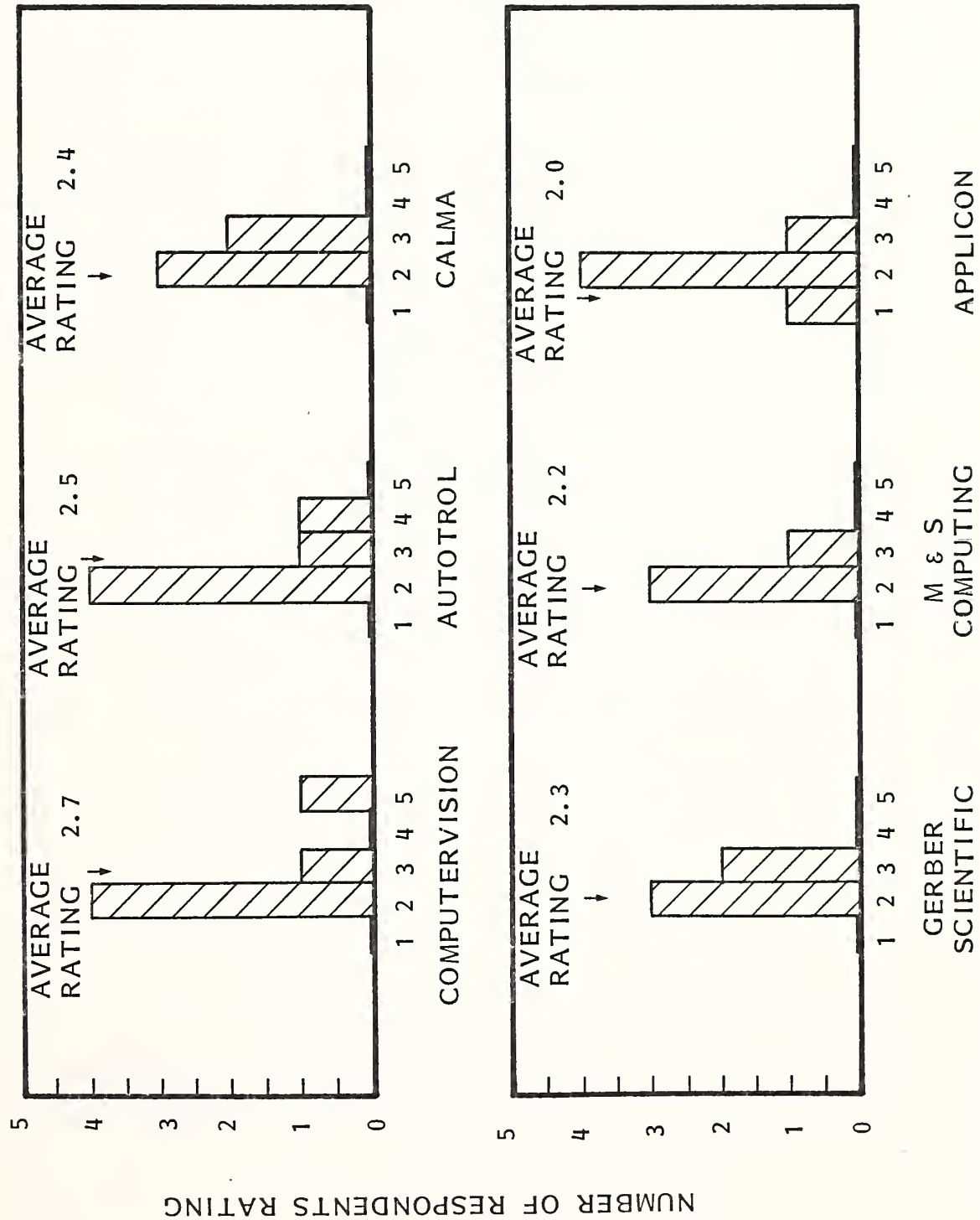
C. COMPETITION

- Only half of the respondents were familiar enough with the existing CAD/CAM turnkey vendors to rate them for adequacy and performance. The ratings of those respondents that were familiar with the vendors are shown in Exhibit V-3.
 - Respondents were in close agreement in rating the existing vendors.
 - All vendors were rated about the same. There were no marked preferences.

EXHIBIT V-3

ADEQUACY AND PERFORMANCE OF EXISTING CAD/CAM TURNKEY

VENDORS IN MEETING PRESENT USERS' NEEDS



NUMBER OF RESPONDENTS = 6 OF 12

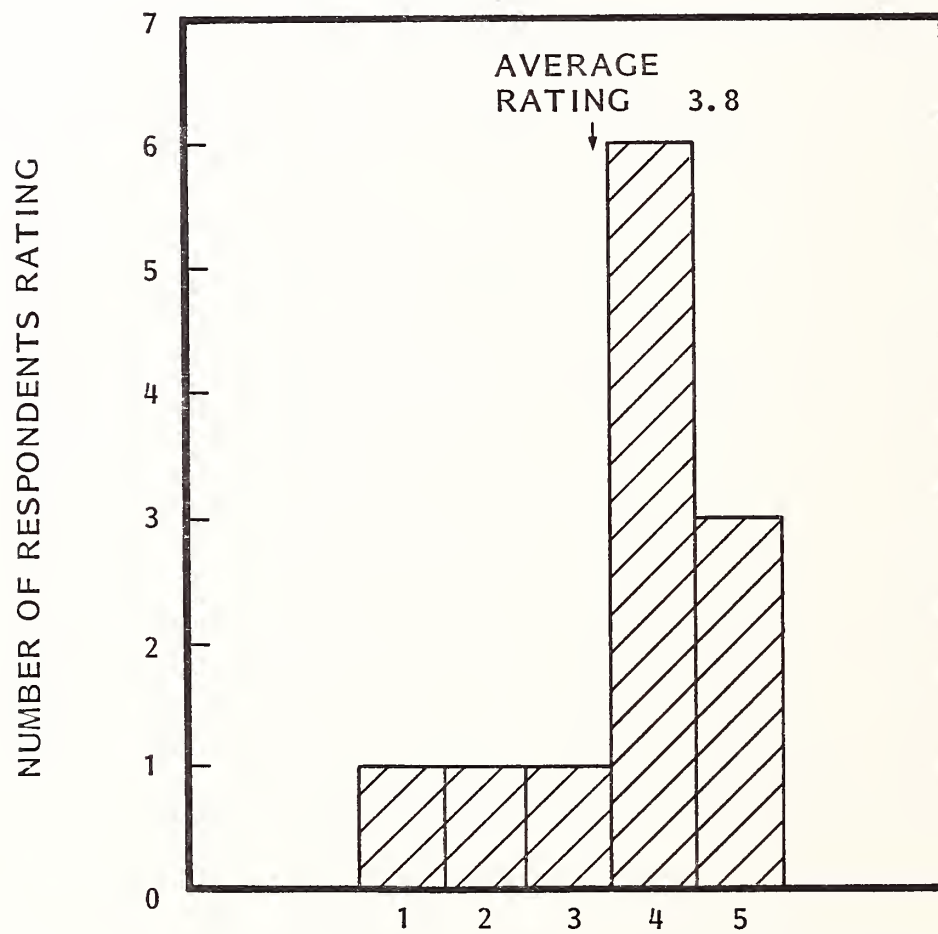
- The ratings were uniformly low, indicating that respondents rate the vendors much below CADAM adequacy and performance.
- A number of the respondents had considered the available turnkey systems before committing to a mainframe approach with CADAM.
 - Basic reasons for choosing CADAM over the turnkey systems were:
 - Turnkey systems software could not begin to match the performance of CADAM.
 - The turnkey systems were too structured. Respondents desired a more manageable data base that could be accessed by all users who needed it.
 - Turnkey systems were not available for lease.
- INPUT does not expect existing turnkey vendors to be formidable competition to LDG systems in the marketplace of existing CADAM users.
 - CADAM software is superior, and CADAM users are committed to it.
 - CADAM users have a generally negative impression of existing turnkey vendors and are not actively considering them.
 - LDG is viewed as a "comfortable" and natural extension of CADAM.
 - If LDG is priced at \$150,000, offers equivalent performance to CADAM terminals, and is driven by the mainframe, it will be comfortably below the price (well over \$250,000) that existing turnkey vendors would probably have to charge.

D. IMPORTANCE OF DISTRIBUTED GRAPHICS TO CADAM USERS

- Respondents' ratings of the need for distributed graphics to realize the full CADAM potential are shown in Exhibit V-4.
 - Respondents were in agreement.
 - Nine out of twelve rated either 4 or 5, where 5 is critical.
 - A typical user's comment was:
 - "It is inevitable that the need for distributed graphics will be highly critical."

EXHIBIT V-4

THE NEED FOR DISTRIBUTED GRAPHICS
TO REALIZE THE FULL CADAM POTENTIAL



RATED ON A SCALE WHERE 5 IS CRITICAL AND 1 IS NOT IMPORTANT

VI MARKET PROJECTIONS

VI MARKET PROJECTIONS

- Respondents identified how many \$150,000, minicomputer-based, CADAM turnkey systems they would require now and in 1985. The results are shown in Exhibit VI-1.
 - Twelve respondents said they needed 28 installations now and 65 installations by 1985.
- Based on the set of assumptions shown in Exhibit VI-2, INPUT projects that Lockheed's revenues from the licensing of CADAM software for the mini-computer-based turnkey system sold to CADAM users will be \$5 million per year in five years.

EXHIBIT VI-1

POTENTIAL NUMBER OF CADAM MINICOMPUTER-BASED, TURNKEY SYSTEMS NEEDED BY RESPONDENTS, 1980-1985

\$150,000 MINICOMPUTER-BASED TURNKEY INSTALLATIONS	YEAR	
	1980	1985
NUMBER OF POTENTIAL INSTALLATIONS	28	65
AVERAGE NUMBER OF POTENTIAL INSTALLATIONS PER RESPONDENT	2.3	5.4

NUMBER OF RESPONDENTS = 12

EXHIBIT VI-2

MARKET PROJECTIONS: \$150,000 TURNKEY SYSTEMS TO CADAM USERS

ASSUMPTIONS:

- 65 CADAM LICENSEES NOW
- GROWING 10%/YR.
- 30% OF CADAM USERS HAVE NO INTEREST
- RESULTS OF STUDY EXTRAPOLATE TO TOTAL CADAM USERS
- \$25,000 CADAM LICENSE FEE INDEXED TO TURNKEY PRICE - GROWING 10%/YR.

PROJECTIONS:

	YEAR 1	YEAR 5
REVENUE TO LOCKHEED	\$500K	\$5M

VII EVALUATION OF VENDORS' PROPOSALS

VII EVALUATION OF VENDORS' PROPOSALS

A. CAL COMP

I. GENERAL

- With the acquisition of Cal Comp and Talos added to their own capabilities, Sanders Associates, Inc., has established a very strong position in the computer graphics market.
 - In 1980 the sales in computer graphics were \$118 million, or 42% of Sanders' total corporate sales.
 - Cal Comp could command considerable resources in management, marketing and product development. They are potentially a very strong partner for Lockheed.

2. TARGETED MARKET

- The targeted market is very specific: the market for a microcomputer-based, turnkey, distributed graphics, automated drafting system selling for \$50,000.
- Prospective customers are companies with annual sales around \$20 million, with less than 500 employees.

- These companies are first-time users in the discrete manufacturing industry.
- This is an attractive market that is presently unpenetrated.
- The strategy will avoid direct competition with the large minicomputer-based CAD/CAM turnkey vendors like:
 - Computervision.
 - Applicon.
 - CALMA.
 - Autotrol.
- The competition will consist of smaller companies that have adopted the same strategy.
 - Some of these are already well established and are enjoying considerable growth in revenues.
 - The leading companies are:
 - Nicolet CAD, a division of Nicolet Instruments.
 - Summagraphics.
 - MDSI.
 - Data Technology.
 - Engineering Systems, Inc.

- The Cal Comp strategy will not compete with IBM, and is designed not to interfere with the role of Sanders as an IBM supplier.
- Present CADAM users evidenced little or no interest in a microcomputer version of Lockheed Distributed Graphics.
 - The Cal Comp system would not successfully compete with the VECTOR GENERAL system.
 - The Cal Comp system would potentially provide Lockheed with an entry into a completely separate market.

3. PRODUCT

- The proposed product, not yet fully defined, is a one-terminal, dual scope system.
 - It is a microcomputer-based system that Cal Comp claims is a microcomputer in name only, with the equivalent capability of an IBM 135.
 - The displays are refresh, raster scan devices.
 - CADAM software would not be used for the user interface module, which Cal Comp would design.
 - The basic price would be \$50,000.
 - The system is basically a computer-aided drafting system with greatly diminished performance compared to CADAM.
 - This is an important factor that should be considered before lending the use of the CADAM name.

4. STATUS

- Cal Comp has a great deal of work ahead in designing and validating the system, before any Sanders commitment can be made to the product, and before anything other than tentative commitments should be made by Lockheed.
- The following technical steps are still ahead:
 - Complete the system specification.
 - Write a functional specification.
 - Design the user interface module.
 - Test the system.
- Cal Comp plans to conduct an extensive market research study to determine the marketability of the product.
 - This is very important to all parties concerned.
 - The study will be subcontracted to a southern California market research firm and will take two months to complete.

5. CONCLUSIONS

- It will be the end of the first quarter before sufficient validation of both the product and the plan is completed to warrant making a firm commitment.
 - The next step would then be demonstration and test marketing.
- The decision for Lockheed to proceed with Cal Comp is independent of the actions taken with either VECTOR GENERAL or ADAGE.

- It is a potentially attractive business arrangement for Lockheed.

B. ADAGE

I. GENERAL

- ADAGE is a \$10-million-per-year company in the interactive computer graphics field.
 - Growth in sales last year was 38%.
 - It is financially sound.

2. TARGETED MARKET

- ADAGE states that it plans to bring out a system for a basic price of \$400,000 in the standalone, turnkey, CAD/CAM market.
 - This would be direct competition to the existing CAD/CAM turnkey vendors, such as Computervision, Applicon, CALMA, et al.
 - It is also getting close to competing with the IBM 4331 systems.

3. PRODUCTS

- ADAGE's product is a two- to six-terminal system based on an IBM plug compatible computer.
- The turnkey system with CADAM would sell for \$400,000.

- ADAGE feels that "a system based on a minicomputer with disk and type drives plus digitizer could not be put together for less than \$300,000."

4. STATUS

- To the best of INPUT's knowledge, ADAGE had not yet disclosed its plans at the time of this writing.

5. CONCLUSIONS

- There is insufficient information to warrant drawing any conclusions about the ADAGE system.
 - However, it could potentially meet the turnkey market in the two- to six-terminal range, in competition with existing turnkey vendors.

C. VECTOR GENERAL

I. GENERAL

a. Description of VECTOR GENERAL

- The following observations about VECTOR GENERAL are based on:
 - Two in-depth telephone interviews with the president of the company.
 - Two in-depth telephone interviews with one of the outside members of the board, who represents the interests of a venture capital firm, a major investor.
- VECTOR GENERAL is a privately owned, 11-year-old firm.

- It was in serious trouble two years ago, and the investors forced the president to resign.
- An officer of one of the venture capital firms, Vernon Anderson of Continental Capital, took over as acting president for a period of eight months.
- Remedial actions were taken during this period, which culminated in the appointment of the present president, John McPherson.
- John McPherson has been there a little over a year now and is credited with making fine progress in restructuring the company.
 - A staff of 160 employees has been reduced to 110, and, at the same time, R&D effort has been increased by 25%.
 - The cash flow is positive.
 - Both the V.P. of Development and the V.P. of Operations are new, highly regarded people.
 - Last year's sales were \$7.3 million, and sales for this year are expected to increase over 20% to \$9 million.
 - . The first quarter is on track.
 - The company's audit firm, Arthur Andersen, has very good reports on the restructured firm.
 - In short, spirits and enthusiasm are high, and the company has a good chance for a bright future.

- VECTOR GENERAL is more than 50% owned by two venture capital firms: Continental Capital and First National Bank of Chicago. The two firms play a major role in the affairs of the company.
- The company is not involved in distributed computer graphics per se, and that is why they are so interested in Lockheed/CADAM as a means to enter this growing market.

b. Financial Plan For LDG

- Compared to the size of VECTOR GENERAL, the proposed investment in CADAM is very large:
 - Large enough, in fact, that to fail would be to seriously damage the company.
 - There would be no doubt that CADAM would receive top-level attention.
 - The plan is to recruit a CADAM General Manager to set up a separate profit center for the business.
- Two tentative commitments have now been made to finance LDG:
 - A rather standard bank commitment to finance 80% of the receivables.
 - A tentative commitment for \$3 million from a group of investors, headed by First National Bank of Chicago, which has been documented in a letter to Lockheed.
- The plan shows a negative cash flow for three years, which is highest during the second quarter of the third year, at which point the picture looks like this:
 - Maximum cash flow = (\$4,370,000).

- Accounts receivable = \$3,500,000.
- Inventory and production float = \$3,000,000.
- VECTOR GENERAL is now willing to share copies of this financial plan with Lockheed, which would be very useful in further validating the plan.
 - One premise in the plan is that profits will be equally divided between Lockheed and VECTOR GENERAL.
- VECTOR GENERAL is also preparing a revised version of the plan to use in seeking outside investors.
 - This plan could be available to Lockheed in a matter of weeks, if desired.

2. TARGETED MARKET

- The targeted market for the VECTOR GENERAL version of LDG is a natural extension of CADAM by offering turnkey distributed graphics systems to present CADAM users.
 - Research in this study confirms the interest and acceptance of present CADAM users for this system.
 - The market is not expected to be highly competitive.
 - The system should be packaged and sold as a new part of existing CADAM.
 - INPUT's market forecast, based on research results, estimates revenues to Lockheed to be \$5.3 million in five years, while VECTOR GENERAL's projections estimate \$4.5 million in four years.

3. PRODUCT

- The proposed product is based on the systems that were developed for Lockheed's internal use.
 - This means that the basic features users require (as identified in the research for this study) have already been proven. Their key features are:
 - Performance equivalent to present CADAM terminals.
 - IBM compatibility.
 - Networking to the host.
 - Adequate response times.
 - Future enhancements to CADAM software.
 - Training.
 - Documentation.
- The system components are well known to Lockheed:
 - Perkin Elmer - Interdata 3220.
 - VECTOR GENERAL refresh, stroke-writing terminals.
- Research indicates that the prices (\$150,000 for a one-station system and \$175,000 for a two-station system) are acceptable.
 - This pricing does not encourage competition from existing turnkey vendors.

- Training would be taken over by VECTOR GENERAL.
 - VECTOR GENERAL's plan for training its people is to work in parallel with Lockheed's people who are presently installing the turnkey systems internally.
 - . After a period of time, VECTOR GENERAL could assume training responsibility for LDG.

4. STATUS

- The VECTOR GENERAL plan is nearly complete.
 - VECTOR GENERAL's financial analysis is now available.
 - Revised copies of the plan could be available in a matter of weeks.
 - The results of this market research study are now complete, and the findings are positive.
 - All that remains are negotiations, should Lockheed decide to go ahead with them.
- VECTOR GENERAL estimates that the formalities of working out the details of a letter of agreement would take about three months.
- If tentative agreement is reached, VECTOR GENERAL should continue by:
 - Arranging financing, conditioned on a letter of interest.
 - Recruiting a general manager.

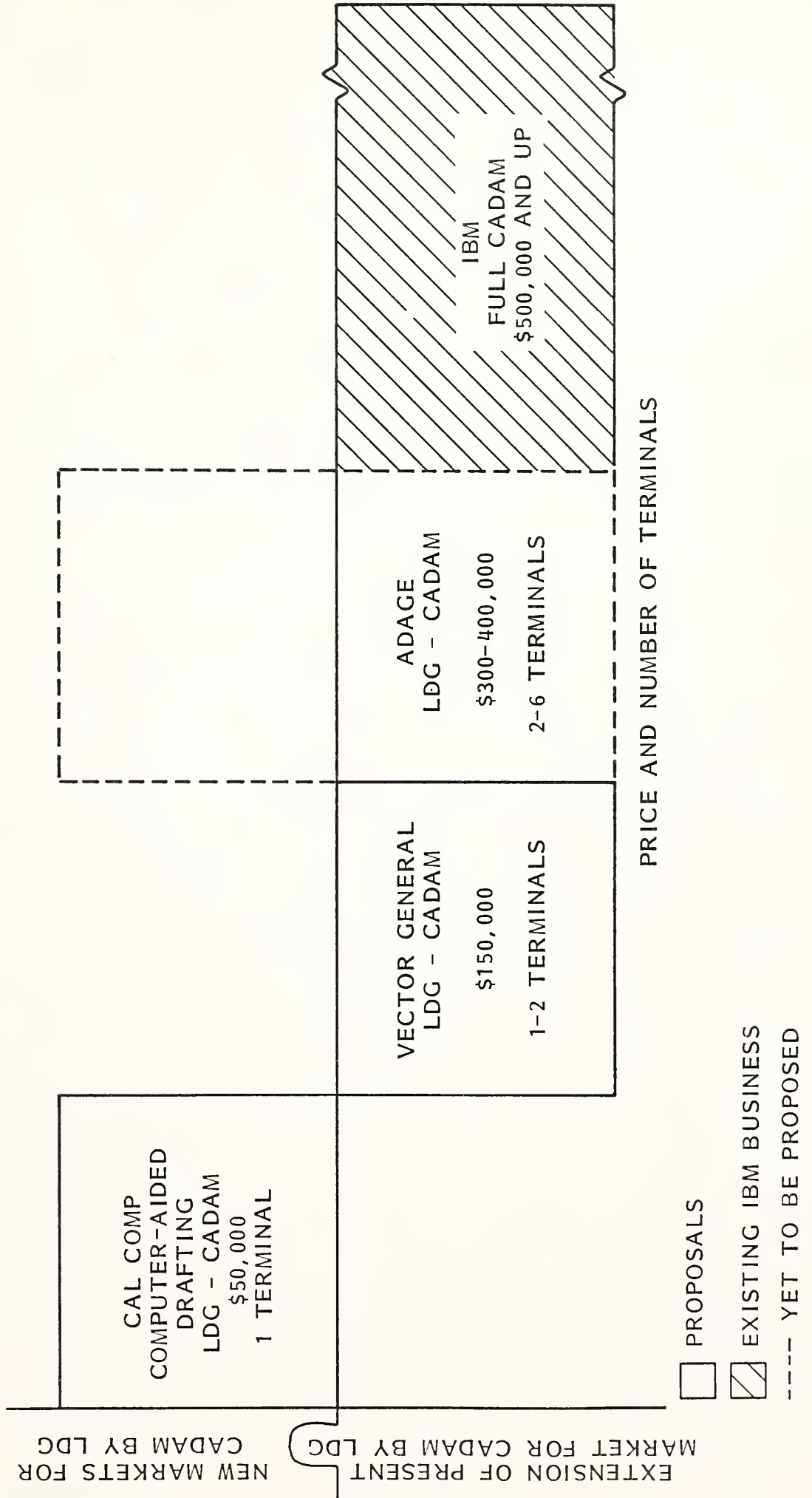
5. CONCLUSIONS

- The findings of this research study support Lockheed's entering into negotiations with VECTOR GENERAL, if Lockheed decides to do so.
- Dealing with VECTOR GENERAL does not preclude future arrangements with Cal Comp or ADAGE, or both.

D. SUMMARY

- The systems and market concepts differ for each of the three vendors proposing to market CADAM turnkey distributed graphics systems, as shown in Exhibit VII-1.
 - Cal Comp, with its one-terminal, \$50,000, computer-aided drafting system, is aimed at small, first-time users, where it will compete with companies like Nicolet CAD and Summagraphics.
 - . It is not attractive to present CADAM users.
 - VECTOR GENERAL, with its \$150,000 distributed CADAM system, is limited to two terminals, but is highly attractive to "friendly" CADAM users.
 - ADAGE has not yet proposed its system, but the two- to six-terminal, \$400,000 system could be marketed to present CADAM users or put into competition with Computervision, et al, in new markets.
 - . The proposed plug compatible turnkey system is close to being competitive to the IBM-4331.
 - IBM with full CADAM will continue to serve large companies with central CADAM computer centers.

SPECTRUM OF CADAM OFFERINGS



APPENDIX A: DATA BASE

EXHIBIT A-1

CADAM LDG INTERVIEW PROGRAM

NUMBER OF RESPONDENTS	TYPE OF COMPANY	TELE- PHONE ON- SITE	NUMBER OF RESPONDENTS	SIZE OF COMPANY
3	AEROSPACE	2 1	4	>\$1B
7	MECHANICAL MANUFAC- TURING	7 0	2	\$500- 1,000 M
2	ELECTRICAL MANUFAC- TURING	1 1	4	\$100- 500 M
12 TOTAL	OVERALL	10 2	2	<\$100 M

TOTAL NUMBER OF RESPONDENTS = 12
(MEMBERS OF CADAM USERS EXCHANGE)

EXHIBIT A-2

MARKET PROJECTIONS:
\$150,000 TURNKEY SYSTEMS
TO
CADAM USERS

ASSUMPTIONS:

- 65 CADAM LICENSEES NOW
- GROWING 10%/YR.
- 30% OF CADAM USERS HAVE NO INTEREST
- RESULTS OF STUDY EXTRAPOLATE TO TOTAL
CADAM USERS
- \$25,000 CADAM LICENSE FEE INDEXED TO TURNKEY
PRICE - GROWING 10%/YR.

PROJECTIONS:

	YEAR 1	YEAR 5
REVENUE TO LOCKHEED	\$500K	\$5M

APPENDIX B: DEFINITIONS

APPENDIX B: DEFINITIONS

BATCH SERVICES This includes data processing performed at vendors' sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and COM processing, are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

BYTE Approximately equivalent to the storage required for one alphanumeric character (i.e., one letter or number).

CENTRAL PROCESSING UNIT (CPU) The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

COMPUTER SERVICES Those services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

DATA BASE MANAGEMENT SYSTEM A generalized computer program which handles the mechanics of storing, updating and accessing data for multiple applications. This definition does not include file management systems which are designed primarily for single applications (e.g., MARK IV, EASTRIEVE).

- **DISTRIBUTED DATA PROCESSING (DDP)**

- INPUT was unable to find a consensus among both users and vendors as to a definition of DDP. It appears to be a concept that is uniquely structured to satisfy individual vendor and user requirements.
- Nonetheless, as a result of extensive work in this area, INPUT offers the following hybrid definition:

"Distributed processing is the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adapted to the user's characteristics."

ELECTRONIC MAIL A range of services which transmit documents consisting of text and graphic material to be read by a person - the quality of the document will be high.

END USER May buy a system from the hardware supplier(s) and do its own programming, interfacing and installation. Alternately, it may buy a turnkey system from a systems house or hardware integrator.

EQUIPMENT COMPATIBILITY A service which allows information to be interchanged among equipment from different manufacturers, and among equipment of different types - terminals, facsimiles, and mainframes are all included.

FACILITIES MANAGEMENT (FM) (Also referred to as "Resource Management" or "Systems Management.") The management of all or part of a user's data processing functions under a long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control as well as operate the facility provided to the user on-site, through communications lines, or mixed mode. Simply providing resources, even though under a long-term contract and/or for all of a users' processing needs, does not necessarily qualify as FM.

GENERAL PURPOSE COMPUTER SYSTEMS A computer designed to handle a wide variety of problems; includes machine room peripherals, systems software, and small business systems.

INFORMATION PROCESSING Data processing as a whole including use of business and scientific computers.

INSTALLED BASE Cumulative number or value (cost when new) of computers in use.

MEAN TIME TO RESPOND The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineer.

MEAN TIME TO REPAIR The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

MEAN TIME BETWEEN FAILURES (MTBF) The elapsed time between hard failures on a device or a system.

MESSAGE A communication intended to be read by a person. The quality of the received document does not have to be high - only readable. Graphic material is not included.

MICROCOMPUTER Combines all of the CPU, memory and peripheral functions of a computer on a chip of silicon. It may be sold in an integrated circuit package or with the addition of more memory and peripheral circuits packaged on a board of a console. Eight bit computer on a chip used as a component.

MINICOMPUTER Usually a 12 to 16 bit computer which is provided with limited applications software and support and represents a portion of a complete, large system.

MULTIPLE DISTRIBUTION A message is transmitted to many locations either pre-selected or listed at time of transmission.

PERIPHERALS Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

PROCESSING SERVICES Processing services encompass FM, RCS, and batch services. They are categorized by type of service, as distinguished from mode of service, bought by users as follows:

GENERAL BUSINESS services are processing services for applications which are common to users across industry categories. Software is provided by the vendor; this can be a complete package, such as a payroll package, or an application "tool," such as a budgeting model, where a user provides much of the customizing of the finished product it uses. General business processing is often repetitive and transaction oriented.

SCIENTIFIC AND ENGINEERING services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or "tools" are used to address different, but similar problems.

INDUSTRY SPECIALTY services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an application "tool" which the user employs to produce its unique solution. Specialty applications can be either business or scientific in orientation; data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry specialty applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.

UTILITY services are those where the vendor provides access to a computer and/or communications network with basic software that enables any user to

develop its own problem solution or processing system. These basic tools include terminal handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

DBMS REVENUES include all revenues directly relating to the processing and storing of data which interacts with the data base management system, as well as programming and training charges related to DBMS application development and usage. Not included as DBMS revenues are pull-through revenues, such as processing charges for the use of other software to manipulate data extracted from the data base management system, or revenue obtained from operating a data base management system purchased by one customer and run exclusively for him.

DATA BASE MANAGEMENT SYSTEM SERVICE provides to a user, for a fee, a data base management system through a Remote Computing Service (RCS).

PROPRIETARY DBMS is a DBMS developed by the RCS vendor or acquired from an external group not actively marketing it as a software product.

THIRD PARTY DBMS is a DBMS developed by someone other than the RCS vendor and marketed by that of another organization as a software product.

PROPRIETARY DBMS VENDOR is one which has a majority of its DBMS revenues from Proprietary DBMS.

THIRD PARTY DBMS VENDOR obtains a majority of its DBMS revenues from Third Party DBMS

PROFESSIONAL SERVICES Management consulting related to EDP, systems consulting, systems design and programming, and other professional services are included in this category. Services can be provided on a basis of: "Time and Materials," whereby the user pays for the time used of an individual on a daily or other fixed rate, or "Fixed Price," where the user pays a fixed fee for a specific task or series of tasks.

REMOTE COMPUTING SERVICES (RCS) Provision of data processing to a user by means of terminals at the user's site(s) connected by a data communications network to the vendor's central computer. There are three sub-modes of RCS:

INTERACTIVE (timesharing) is characterized by interaction of the user with the system, primarily for problem solving timesharing, but also for data entry and transaction processing; the user is "on-line" to the program/files.

REMOTE BATCH is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.

DATA BASE is characterized by the retrieval of information from a vendor-maintained data base. This may be owned by the vendor or a third party.

REMOTE COMPUTING SERVICES (RCS) REVENUES are those revenues obtained by the provision of data processing to a user by means of a terminal at the user's site(s). The terminal is connected by a data communications network to the vendor's central computer. Not included as RCS revenues are sales to captive companies (i.e., companies which are part of the same corporate entity as the vendor).

SIC Standard Industrial Classification. Developed for use in classifying establishments by type of activity to facilitate and promote uniformity, as well as comparability, in the collection and presentation of statistical data on economic activities.

SMALL BUSINESS COMPUTER For the purpose of this study, it is a system which is built around a Central Processing Unit (CPU), and which has the ability to utilize at

least 20M bytes of disk capacity, to provide multiple CRT work stations, and to offer business-oriented system software support. Minicomputer based system used for general business data processing and for specialized industry oriented business applications.

SOFTWARE Computer programs.

SOFTWARE PRODUCTS This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. There are two sub-categories:

SYSTEMS PACKAGES OR SYSTEMS SOFTWARE are operating systems, utilities, and languages routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, diagnostic software, and sorts.

APPLICATIONS PACKAGES OR APPLICATIONS SOFTWARE are software which perform processing to serve user functions. They consist of general purpose packages, such as accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.

SYSTEMS ANALYST Individual who analyzes problems to be converted to a programmable form for application to computer systems.

SYSTEMS HOUSE Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. It may also develop system software products for license to end users.

- **USER SITE HARDWARE SERVICES (USHS)**

- Place intelligent hardware (i.e., terminals, microcomputers, minicomputers) at the user's site or at the vendor's site dedicated to the user.
- Offer significant RCS vendor-supplied software for execution on vendor-supplied intelligent hardware.
- Offer user access to the RCS vendor's communications network.
- Offer user access through the vendor's RCS networks to the vendor's mainframes or other intelligent hardware supplied to the user by the vendor.

VALUE ADDED NETWORK (VAN SERVICES) are the regulated communications network services that offer more than simple point-to-point connections.

APPENDIX C: QUESTIONNAIRE

CADAM USER SURVEY R

This survey has been commissioned to provide information to assist in the improvement of the CADAM system for the user.

In addition to continued enhancements to present CADAM system software, consideration is being given to extending CADAM to installations requiring less than five stations by means of turnkey systems.

1. Please describe your company

	(✓)	Comments
• Aerospace	_____	_____
• Architectural	_____	_____
• Automotive	_____	_____
• University	_____	_____
• Other	_____	_____

2. Please describe your present CADAM system installation.

- Number of stations _____
- Number of terminals _____
- Type of computer(s) _____

3. Please indicate your degree of satisfaction with the CADAM system software, on a scale of 1 to 5, where 5 is completely satisfactory and 1 is unsatisfactory.

	Rating	Do not have
A. ● CAD-Only Interactive Module	_____	_____
● CAD/CAM Interactive Module	_____	_____
● Data Management Module	_____	_____
● Hardcopy Module	_____	_____
● Automatic Programmed Tool (APT) Interface Module	_____	_____
● Statistical Data & Report Generation Module	_____	_____
● Accounting Information Module	_____	_____
● Geometry Interface Module	_____	_____
● 3D Design - Surface Geometry	_____	_____
● 3D Design - Mesh Geometry	_____	_____

- B. The overall adequacy of CADAM system software to meet your needs, now and in 1985.

	1980	1985
Rating	_____	_____
Comments:	_____	

4. Please indicate your degree of satisfaction with the CADAM system training, on a scale of 1 to 5, where 5 is completely satisfactory and 1 is unsatisfactory

A. Title of Course Rating

- Basic Graphics Terminal Operations Course _____
- On-the-Job Training Course _____
- Numerical Control Prog'g Course _____
- Other _____

B. Please indicate degree of satisfaction with training documentation.

Rating _____

Comments: _____

C. What is your preference for location of training

☐ User on-site ☐ At Lockheed/IBM

Comments: _____

D. How satisfied are you with current CADAM system user support services?

Rating _____

5. Are response times a problem in CADAM systems now and do you expect they will be in 1985. Please rate on a scale where 5 is a major problem and 1 is no problem at all.

	1980	1985
RATING	_____	_____

6. What software enhancements, support packages, new applications would you like to see with the CADAM system?

7. Please indicate the degree of your interest in considering extending CADAM to installations of ≤ 5 stations by means of low cost, turnkey distributed graphics systems.

- ☐ Very Interested
- ☐ Would like to consider
- ☐ Moderately Interested
- ☐ Little Interest
- ☐ No Interest at all

If no interest at all, terminate the interview.

Note: Definition of turnkey systems:

T/K = Free-standing (turnkey) systems either minicomputer or microcomputer based.

8. Would your needs be met best by:

_____ Minicomputer based systems, offering basically the same CADAM capability as stations served by the in-house computer, selling at a base price of \$150,000?

_____ or, microcomputer based systems, with reduced CADAM capability, at a base price of \$ 50,000?

_____ Other (Specify) _____

9. How many CADAM turnkey systems would you require, now and in 1985:

	1980	1985
● \$150,000 minicomputer based systems		
Number of systems	_____	_____
Number of terminals	_____	_____
● \$ 50,000 minicomputer based systems		
Number of systems	_____	_____
Number of terminals	_____	_____

10. What are the most important reasons for buying CADAM distributed graphics turnkey systems. Please rate on a scale of 1-5 where 5 is most important and 1 is unimportant.

RATING

- Physically remote locations _____
- Off Load the central computer _____
- Stringent security needs,
governmental or industrial _____
- First time purchasers of a
graphics system who wants to
implement CADAM without a
major hardware expenditure _____
- An engineer who requires a
stand-alone system _____
- Smaller manufacturers who
have limited design engineering
manpower _____
- Other _____

11. In deciding to install a turnkey system how do you see the relative importance of price vs. performance on a scale of 1-5 where 5 is the most important factor and 1 is relatively unimportant.

- Price Rating _____
- Performance Rating _____

12. Do you see the CADAM distributed graphics turnkey systems as a natural extension of or as an alternative to the present Lockheed/IBM CADAM systems?

☐ Natural Extension

Comments _____

☐ Alternative to

Comments _____

13. When installing stand-alone mini or microcomputer based systems would you:

☐ Start with one installation then add more as you gain experience with the first installation

☐ Plan multiple installations from the beginning

☐ Have no requirements for multiple installations

Comments _____

INPUT

14. The proposed CADAM distributed graphics systems could be networked with in-house host systems. On a scale of 1-5, where 5 is essential and 1 is unimportant what do you see to be the importance of the following factors:

- IBM Compatibility Rating_____
- Networking with in-house computer(s) Rating_____

15. If CADAM software for such a distributed graphics system was leased separately from the hardware purchase, would you prefer

- ☐ Fully paid up lease
- ☐ Monthly lease
- ☐ Other _____
- _____
- _____

16. Please rank your requirements for field service (highest priority is 1):

☐ On-site

Comments _____

☐ Eight hour response

Comments _____

☐ Twenty Four hour response

Comments _____

☐ Customer training

Comments _____

17. How would you rate the adequacy and performance of existing CAD/CAM turnkey vendors to fill your needs now and in 1985. On a scale where 5 is completely adequate and 1 can't begin to fill the needs.

	RATING	
	1980	1985
Applicon	_____	_____
Autotrol	_____	_____
Calma	_____	_____
Computervision	_____	_____
Gerber Scientific	_____	_____
M & S Computing	_____	_____
Other _____	_____	_____

18. How do you see your CAD/CAM needs being supplied by the various modes of delivery, now and in 1985. Please estimate the percentage breakdown.

	1980	1985
• FREESTANDING (TURNKEY SYSTEMS (Mini or Micro computer based)	_____	_____
• LARGE IN HOUSE HOST SYSTEMS	_____	_____
• REMOTE COMPUTING SYSTEMS	_____	_____
	100%	100%

19. Do you believe that an important need exists for distributed graphics in order to realize the full potential of CADAM. Please rate on a scale where 5 is critical and 1 is not important.

RATING _____

20. Comments about this survey or about the CADAM system in general:
